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Invited Commentary

The Impact of Female Gender on Outcome Following Carotid Revascularisation

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Women at any age have a lower risk of stroke than men. However, because women on average live longer than men and the risk of stroke increases with advancing age, the burden of stroke is greater in women than in men.[1] The recognition of sex differences has raised awareness of the burden of cardiovascular disease in women in the last decade, giving further rise to analyses on intervention-type-specific outcome differences between sexes.[2]

In terms of long-term stroke prevention by carotid endarterectomy (CEA), women do not gain equivalent clinical benefit with respect to men for both symptomatic[3] and asymptomatic carotid stenosis.[4] The lower magnitude of benefit in women is most probably due to a (slightly) higher procedural risk as compared with men,[5] combined with the lower natural history risk of stroke in women.

Bisdas et al. retrospectively assessed sex-differentiated in-hospital outcomes following CAS (Carotid Angioplasty with Stenting) or CEA in mainly asymptomatic patients,[6] based on discharge data from the New York state on an impressive nearly 70 000 hospitalisations for carotid intervention over a decade. Asymptomatic men and women showed comparable outcomes after both procedures. Procedural stroke rates were higher after CAS as compared to CEA in all sub-groups (but only significantly different in symptomatic women). There was a twofold increase in stroke/mortality rate in symptomatic women undergoing CAS compared to those who had CEA, an observation confirmed by others.[7] Of relevance, as stroke after CAS may occur for a relevant part in the days following revascularisation, the in-hospital analysis performed might significantly underestimate the event rate, especially in the CAS cohort.

Of note, especially in the light of the ongoing CREST (Carotid Revascularisation Endarterectomy Versus Stenting Trial) controversy, myocardial infarction (MI) showed not to be a main driver of the composite 'end' point independent of presenting neurological status for both sexes. Asymptomatic women were more prone to MI after both revascularisations than men, a finding confirmed in randomised data.[8] Unfortunately, no clear definition of MI other than a discharge 'code 410' in any position could be provided. Furthermore, and highly surprisingly, no dedicated The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) procedural code was available for CAS (see legend Fig. 1). Influence of hospital annual volume on CAS and CEA outcomes remained unclear. Within women, only 2074 patients received CAS, and out of these, only 250 received stenting for a symptomatic lesion. Over a 10-year time frame, with statewide discharge data from (e.g.) 25 centres, the CAS experience for symptomatic lesions could have been only two per centre per year! The cut-off for hospital CAS volume was 17 procedures, but this was clearly reached predominantly by treating asymptomatic patients.

In any case, women have higher perioperative adverse events (i.e., stroke, combined death/stroke and MI) rates than men. The authors recommend that "these sex-associated differences should be taken into account for the treatment of carotid artery disease." But how? – for the time being, until data from the ongoing ACST2 (Asymptomatic Carotid Surgery Trial) or SPACE2 (Stent-Protected Angioplasty versus Carotid Endarterectomy) trials will prove otherwise, by predominantly treating symptomatic patients, and offering both men and women CEA as treatment of first choice.

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